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Applicant(s): LG Electronics Inc.

COMMISSIONER

[ABSTRACT OF DISCLOSURE]

[ABSRTACT]

The present invention relates to a method for managing graphic data for a high-density recording medium in accordance with the invention allows one or more graphic images to be overlaid on a movie video or still image simultaneously or individually in succession, allows graphic images to be presented along with audio, and allows displaying of various graphic images such as buttons for selecting associated functions.

[REPRESENTATIVE DRAWING/ TYPICAL DRAWINGS]

FIG. 5

[INDEX WORDS]

BD-ROM, graphic image, navigation information, source packet, display

[SPECIFICATION]

[TITLE OF THE INVENTION]

METHOD FOR MANAGING A GRAPHIC DATA OF HIGH DENSITY OPTICAL DISC

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIG. 1 illustrates a graphical representation of main video overlaid with graphic images according to the DVD-Video standard;

FIG. 2 illustrates a structure of graphic data in the

DVD-Video standard;

FIG. 3 illustrates a graphical representation of a plurality of graphic images of different sizes and color depths to be overlaid on a main picture according to the present invention;

FIG. 4 illustrates a graphical representation of a main data overlaid with a plurality of graphic images of different sizes and color depths;

FIG. 5 illustrates a flow chart of operation in one embodiment according to the present invention;

FIGS. 6 to 8 illustrate examples showing how graphic images and navigation information are recorded in a main stream on a high density recording medium according to the present invention;

FIGS. 9 to 13 illustrate exemplary embodiments of graphic information in accordance with the invention; and

FIGS. 14 to 20 illustrate exemplary embodiments of navigation information in accordance with the invention.

[DETAILED DESCRIPTION OF THE INVENTION]

[OBJECT OF THE INVENTION]

[FIELD OF THE INVENTION AND BACKGROUND OF THE RELATED ART]

The present invention relates to a method of managing graphic data for a high-density recording medium such as an optical disk (e.g., a Blu-ray Disc ROM).

In general, recording data such as recording media such as optical disks capable of recording large amounts of high-quality digital video/audio data, for example, DVDs (digital versatile disks) are now commercially available on the market. The types of DVDs include DVD-Video, DVD-VR (Video Recording), DVD-Audio, and DVD-AR (Audio Recording).

In the DVD-Video, graphic data to be reproduced in synchronization with a video/audio data stream is defined by the DVD-private format and designated as sub-pictures.

A sub-picture of the graphic data is of size 720*480 pixels and has a palette with 2-bit color depth, which can support up to 16 colors. The graphic data is recorded on the DVD after being multiplexed with the video/audio stream.

A run-length coding method according to the DVD-Video standard is applied to the graphic data in which display control information about sub-picture data is included. The display control information includes information on display timing, color change, blending ratio change, display position, size selection, etc.

Operations for providing various graphic effects to the graphic data, such as scroll-up/down, fade/wipe-in/out, and color change, can be performed selectively on a time basis. Navigation information for the palette information is defined for each title and program chain and includes

information on 16 colors and the number and attributes of sub-pictures.

The attributes of sub-pictures may include caption information, director's comments, and aspect ratio information for various applications as well as coding mode information and language information.

An optical disk reproducing apparatus such as a DVD player displays the main video image and some or all of the graphic image of a sub-picture unit (SPU) as shown in FIG. 1 by blending the images using navigation information, wherein the graphic image of the sub-picture unit (SPU) is overlaid on the main video image on a presentation time basis.

As shown in FIG. 2, sub-picture packs (SP_PCKs) are recorded intermittently among audio packs (Audio_PCKs) and video packs (Video_PCKs) recorded successively. Each of the audio and video packs is of size 2048 bytes.

During data reproduction, the sub-picture packs are read and then grouped into a sub-picture unit (SPU), which includes a sub-picture unit header, pixel data, and display control information.

The sub-picture unit header includes the data size of the sub-picture unit. The pixel data includes 2-bit depth bitmap data encoded by the run-length coding method. The

palette information for the pixel data is recorded as separate navigation information.

The optical disk reproducing apparatus reproduces the pixel data along with the audio and video data, the pixel data being synchronized with the audio and video data. As alluded to above, the apparatus displays the main video image and some or all of the graphic image of a sub-picture unit (SPU) by blending the images using the navigation information, wherein the graphic image of the sub-picture unit (SPU) is overlaid on the main video image in various ways on a presentation time basis.

The standardization for high-density read-only optical disks such as the Blu-ray disc ROM (BD-ROM) is still under way. A method for effective managing graphic data recorded on the high-density read-only optical disk such as a BD-ROM is not yet available.

[TECHNICAL SOLUTION OF THE INVNETION]

In order to solve the above problems, the present invention is to provide a method of managing graphic data for a high-density recording medium such as a BD-ROM capable of recording high quality graphic data and navigation information.

[SYSTEM AND OPERATION OF THE INVENTION]

In order to achieve the above objects, a method of managing graphic data for a high density optical disk is characterized for multiplexing graphic images with a high resolution corresponding to the main stream of the high density optical disk with the main stream to record it and recording the navigation information in order to reproduce the graphic images in the source packets of the graphic images.

Preferably, the method of the present invention is to record graphic images of high resolution corresponding to the main stream of a high density optical disk and to record and manage the navigation information for displaying the graphic images simultaneously with the video or audio as a playlist graphic mark.

Moreover, the method of the present invention is to record graphic images of high resolution corresponding to the main stream of a high density optical disk and to record and manage the navigation information for displaying the graphic images simultaneously with the video or audio as a playlist graphic indicator.

In addition, the method of the present invention is to record graphic images of high resolution corresponding to the main stream of a high density optical disk and to record and manage the navigation information for displaying

the graphic images simultaneously with the video or audio as a playlist SubPlayItem.

And, the method of the present invention is to record graphic images of high resolution corresponding to the main stream of a high density optical disk and to record and manage the navigation information for displaying the graphic images with the still images at the same time as still image information.

Finally, the method of the present invention is to record graphic images of high resolution corresponding to the main stream of a high density optical disk and to record and manage the navigation information for displaying the graphic images on the menu screen as selection buttons as button information in the Menu_information.

Hereinafter, exemplary embodiments of the method of managing graphic data for a high-density optical disk according to the present invention will now be described with reference to the accompanying drawings.

FIG. 3 is a graphical representation of an embodiment of a method of managing graphic data for a high-density optical disk in accordance with the present invention. A main picture image has one or more corresponding graphic images, which have different sizes and color depths.

As shown, the main picture of size 1920*1080 pixels has three different associated graphic images, a graphic image of size 1920*1080 pixels, a graphic image of size 640*1080 pixels.

The three graphic images have different color depths. The 1920*1080 graphic image has an 8-bit color depth, the 1280*1080 graphic image has an 8-bit or 16-bit color depth, and the 640*1080 graphic image has an 8-bit, 16-bit, or 24-bit color depth.

As shown in FIG. 4, a plurality of different graphic images, graphic images 1,2 and 3 may be simultaneously overlaid on one main picture image and the plurality of graphic images may have different sizes and color depths. The plurality of graphic images may be managed individually or as a group.

The overlaid graphic images and navigation information therefore are multiplexed with main video and audio streams, which will be described in detail below.

FIGS. 5 to 8 illustrate examples showing how graphic images and navigation information are recorded in a main stream on a high density recording medium such as a BD-ROM. As shown in FIG. 5, multiple graphic images are recorded in a prescribed recording segment (e.g., A, B, or C) of an audio/video main stream recorded in a data area of

a BD-ROM. The multiple graphic images are multiplexed in the prescribed segment.

Graphic images recorded in the prescribed segment, (e.g, A) are graphic images to be overlaid with the main stream recorded after the segment. A graphic image is recorded as a plurality of 192-byte TP (Transport Packet) extra header and a 188-byte MPEG TP. In the recording segment, only graphic images are recorded or graphic images are multiplexed with the main stream.

The 4-byte TP extra header may include 2-bit copy protection information and 30-bit navigation information for an associated graphic image (e.g., Image_start_end_flag described in detail below) or a 30-bit packet arrival time stamp.

In detail, if a source packet is associated with a graphic image, the TP extra header thereof includes copy protection information and graphic information (e.g, Image_start_end_flag described in detail below). Otherwise, the TP extra header includes copy protection information and a packet arrival time stamp.

The header of an MPEG2 TP includes a packet identifier (PID). The PID is given a unique value, for example, 'PID=0*1023' when the packet is a graphics packet.

Because graphic images are recorded as MPEG2 TPs in the recording segment, the recording format of the graphic images is compatible with that of movie data, for example, movie data of the BD-RE format. When graphic images and a main stream are multiplexed in the prescribed recording segment, the main stream corresponds to one among MPEG2 movie data, audio data, or still images.

As shown in FIG. 6, the beginning part of the prescribed recording segment includes a source packet of graphic information for managing reproduction of the graphic images recorded therein. An optical disk reproducing apparatus performs reproduction of the graphic images by checking the number of graphic images, data size, etc. using the graphic information.

The graphic images recorded in the prescribed recording segment can be identified by the source packet of the graphic information. As shown in FIG. 7, the graphic information contained in the payload of the source packet may include fields of `graphic_start_end_flag`, `number_of_images`, `image_info` indicating attributes and properties of each graphic image (e.g., position to display a graphic image, presentation time to display a graphic image, duration to display a graphic image, etc.), and

image_data_size indicating the size of each graphic image or start position information.

If the graphic_start_end_flag field is '0', it indicates the beginning of the graphic data; if the graphic_start_end_flag field is '1', it indicates the ending of the graphic data. Some of the fields of the graphic information can be used as information about one graphic image or all of the graphic images.

In an example shown in FIG. 8, the graphic images recorded in the prescribed recording segment can be identified by the TP extra header, wherein the TP extra header of the first source packet of each graphic image includes 2-bit copy protection information and 30-bit graphic information. The graphic information can be defined in the same manner as the graphic information shown in FIG. 7.

The TP extra header of the other source packets includes 2-bit copy protection information and other 30-bit information such as a packet arrival time stamp.

If a high density recording medium such as a BD-ROM disk having graphic images and graphic information recorded in the aforementioned manner is inserted into an optical disk reproducing apparatus, the apparatus conducts a preloading operation that loads all the graphic data

recorded in a prescribed segment into a graphic image buffer, as shown in FIG. 9.

When reproducing a main stream (e.g., movie video, audio, or still images) recorded after the prescribed segment, the optical disk reproducing apparatus sequentially reproduces the graphic images in the graphic image buffer along with the main stream using the graphic information as described above with reference to FIG. 7 and FIG. 8.

When the graphic images are reproduced along with a movie as shown in FIG. 10, the graphic images are overlaid on the movie video, wherein the graphic images may be overlaid on the movie video simultaneously or individually in succession and the positions of the graphic images on the movie video may be different from each other.

When the graphic images are reproduced along with an audio-only clip as shown in FIG. 11, one or multiple graphic images are displayed at a particular position(s) of the screen, wherein the graphic images may be presented simultaneously or individually in succession as in animations and the positions of the graphic images may be different from each other.

When the graphic images are reproduced along with still images are shown in FIG. 12, the graphic images are

overlaid on the still images, wherein the graphic images may be overlaid on one still image simultaneously or individually in succession and the positions of the graphic images on the still images may be different from each other.

The graphic images may be presented along with audio and still images as shown in FIG. 13, wherein the graphic images are overlaid on the still images at a particular position(s). The graphic images may be overlaid on one still image simultaneously or individually in succession and the positions of the graphic images on the still images may be different from each other.

In an embodiment of a method of recording and managing navigation information for reproduction of the graphic images as shown in FIG. 14, navigation information for one or multiple graphic images is stored in a playlist for playback control of a movie or audio-only clip A/V stream as graphic marks or playlist graphic indicators.

When the navigation information is stored as graphic marks, the mark syntax of, for example, the BD-RE standard may be used for the graphic mark by extending the meaning of each field thereof, as shown in FIG. 15. Accordingly only the difference from the BD-RE standard will be described. The mark_type field of the graphic mark is given

a unique value that is not defined in the BD-RE standard, for example, 'mark_type=0*13'.

The graphic mark includes ref to_graphic_start_index field for indexing a beginning graphic image or graphic image group, duration information for specifying display duration required for all of the graphic images, and number_of_graphic-images field indicative of the number of graphic images to be displayed.

For each graphic image, the graphic mark further includes a ref_to_graphic image_index field for indexing each of the graphic images, display timing information for specifying display start time and display duration for each of the graphic images, display_info field for specifying display position and window size of each of the graphic images on a main image, and display_effect field for providing various graphic effects such fade/wipe-in/wipe-out for each of the graphic images.

When the navigation information is stored as playlist graphic indicators, the syntax of the playlist graphic indicator, which is not defined in the BD-RE, is newly defined and a unique version number that is not used in the BD-RE is assigned to the playlist graphic indicators, as shown in FIG. 16.

The playlist graphic indicator information field includes a length indicator indicating a length of the playlist still indicator information field and a number_of_Graphic_Display_positions field indicating the number of graphic display positions. For each graphic display position, the playlist graphic indicator field further includes a graphic_display_start_time_stamp field, and duration information.

The playlist graphic indicator further includes number_of_graphic_images field indicative of the number of graphic images to be displayed. For each image, the following additional fields are provided: a ref_to_graphic_image_index field for indexing each of the graphic images, display timing information for specifying display start time and display duration for each of the graphic images, display_info field for specifying display specifying display position and window size of each of the graphic images on a main image, and display-effect field for providing various graphic effects such fade/wipe-in/wipe-out.

In another embodiment shown in FIG. 17, navigation information for one or multiple graphic images is stored as sub-playitems in a playlist for playback control of a movie or audio-only clip A/V stream. The syntax of the sub-

playitem for graphic images is extended from the syntax of the general sub-playitem defined for managing dubbed audio in the BD-RE.

As shown in FIG. 18, the syntax of the sub-playitem for graphic images conforms to the syntax of the general sub-playitem but some fields are extended to include graphic control information. Accordingly, only the differences from the general definition will be described. The length field of the sub-playitem is given a unique value greater than or equal to the 26 bytes that is defined in Ver. 1.0 of BD-RE standard.

The sub-playitem includes a Clip_codec_identifier field for indicating that the sub-playitem is associated with a graphic image and a SubplayItem_type field for specifying a path for displaying the associated graphic image. For example,, the Clip_codec_identifier field may have a value of 'GRAF' and the SubplayItem_type may have a value of 4.

The sub-playitem includes SubPlayItem_IN_time field for indicating the display time of a beginning graphic image and SubPlayItem_OUT_time for indicating display duration or ending time of all of the graphic images. The sub-playitem further includes ref_to_graphic_image_index field for indexing each of the graphic images, display

timing information for specifying display start time and display duration for each of the graphic images, display_info field for specifying display position and window size of each of the graphic images on a main image, and display_effect field for providing various graphic effects such fade/wipe-in/wipe-out for each of the graphic images.

In another embodiment of a method of recording and managing navigation information for reproduction of graphic images along with still images, the navigation information is stored as still image information, which includes a graphic_display_info field, as shown in FIG. 19. The still image information may be stored in a playlist file or stored as an individual file. For example, the playlist graphic indicator of FIG. 16 may be newly defined as a graphic display information field in the still image information field.

The graphic display information field includes a length indicator indicating a length of the graphic display information field and a number_of_graphic_images field indicating the number of graphic images to be displayed. For each graphic image,, the graphic display information field includes the fields of: a ref_to_graphic_image_index field for indexing each of the graphic images, display

timing information for specifying display start time and display duration for each of the graphic images, display_info field for specifying display position and window size of each of the graphic images on a main image, and display_effect field for providing various graphic effects such fade/wipe-in/wipe-out, as described above with reference to FIG. 18.

As described above, embodiments of the present invention has been disclosed as examples, those skilled in the art, having the benefit of this disclosure, will appreciate numerous modifications and variations within the spirit and scope of the invention.

[EFFECT OF THE INVENTION]

Accordingly, the recording medium having a method for managing graphic data for a high-density recording medium in accordance with the invention allows one or more graphic images to be overlaid on a movie video or still image simultaneously or individually in succession, allows graphic images to be presented along with audio, and allows displaying of various graphic images such as buttons for selecting associated functions.

What is claimed is:

1. A method of managing graphic data for a high density optical disk is characterized for multiplexing graphic images with a high resolution corresponding to the main stream of the high density optical disk with the main stream to record it and recording the navigation information in order to reproduce the graphic images in the source packets of the graphic images.

2. A method of claim 1, wherein the graphic images may recorded to be multiplexed with the main stream in the predetermined recording segment where the main stream is recorded or the graphic images may recorded without the main stream.

3. A method of claim 2, wherein the graphic images recorded in the predetermined recording segment are reproduced with the movie data, audio, or still images recorded sequentially after the predetermined recording segment.

4. A method of claim 1, wherein the source packet of the graphic images comprises:

a TP(Transport Packet) extra header; and

MPEG2 TP; wherein the payload of the MPEG2 TP packet further comprises navigation information for reproducing graphic images.

5. A method of claim 1, wherein the source packet of the graphic images comprises:

a TP(Transport Packet) extra header; and

MPEG2 TP; wherein the TP extra header further comprises navigation information for reproducing graphic images.

6. A method of claim 4 or 5, wherein the navigation information recorded in the payload of the MPEG2 TP packet or TP extra header comprises:

at least one of fields of graphic_start_end_flag;

number of images;

image_info indicating attributes and properties of each graphic image; and

image_data_size.

7. A method of claim 4, wherein the MPEG2 TP packet header further comprises identified packet ID for indicating a corresponding packet is the navigation information source packet.

8. A method of claim 2, wherein the graphic images recorded in the predetermined recording segment are reproduced to pre-load in the inner buffer, and according to the navigation information one or plurality of the above graphic images are reproduced with one of the movie video, audio, or still image reproduced sequentially.

9. A method of managing graphic data for a high density optical disk is characterized for recording the graphic images with a high resolution corresponding to the main stream, and recording and managing the navigation information for displaying the graphic images simultaneously with the video or audio as a playlist graphic mark.

10. A method of claim 9, wherein the The graphic mark includes:

ref to_graphic_start_index field for indexing a beginning graphic image or graphic image group;

duration information for specifying display duration required for all of the graphic images; and
number_of_graphic-images field indicative of the number of graphic images to be displayed.

11. a method of claim 10, wherein the graphic mark maintains the mark syntax of, for example, the BD-RE standard may be used for the graphic mark by extending the meaning of each field thereof, and the mark_type field of the graphic mark is given a unique value that is not defined in the BD-RE standard.

12. A method of the present invention is to record graphic images of high resolution corresponding to the main stream of a high density optical disk and to record and manage the navigation information for displaying the graphic images simultaneously with the video or audio as a playlist graphic indicator.

13. A method of claim 12, wherein the playlist graphic indicator information field includes a length indicator indicating a length of the playlist still indicator information field and a number_of_Graphic_Display_positions field indicating the number of graphic display positions. For each graphic display position, the playlist graphic indicator field further includes a graphic_display_start_time_stamp field, and duration information.

14. A method of claim 13, wherein the syntax of the

playlist graphic indicator, which is not defined in the BD-RE, is newly defined and a unique version number that is not used in the BD-RE is assigned to the playlist graphic indicators.

15. A method of the present invention is to record graphic images of high resolution corresponding to the main stream of a high density optical disk and to record and manage the navigation information for displaying the graphic images simultaneously with the video or audio as a playlist SubPlayItem.

16. A method of claim 15, wherein the sub-playitem includes a Clip_codec_identifier field for indicating that the sub-playitem is associated with a graphic image and a SubplayItem_type field for specifying a path for displaying the associated graphic image.

17. A method of claim 16, wherein the sub-playitem compatible with the sub-play item of the BD disk, extending the meaning of the field, and further includes control information of the graphic images.

18. A method of the present invention is to record graphic images of high resolution corresponding to the main stream of a high density optical disk and to record and manage the navigation information for displaying the graphic images with the still images at the same time as still image information.

19. A method of claim 18, wherein the still image information field includes the fields of:

a ref_to_graphic_image_index field for indexing each of the graphic images;

display timing information for specifying display start time and display duration for each of the graphic images;

display_info field for specifying display position and window size of each of the graphic images on a main image; and

display_effect field.

20. A method of claim 19, wherein the still image information may be recorded in the BD disk playlist or recorded as a newly defined file.

21. A method of the present invention is to record graphic images of high resolution corresponding to the main stream of a high density optical disk and to record and manage the navigation information for displaying the graphic images on the menu screen as selection buttons as button information in the Menu_information.

22. A method of claim 21, wherein the Menu_information may be recorded in the BD disk playlist or recorded as a newly defined file.

23. A method of claim 22, wherein the button information may comprises at least one field of:

number of images displayed as selection buttons on the Menu screen;

a ref_to_graphic_image_index field for indexing each of the graphic images;

display timing information for specifying display start time and display duration for each of the graphic images;

display_info field for specifying display position and window size of each of the graphic images on a main image; and

display_effect field.